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MORAL HAZARD: THE RELATIONSHIP BETWEEN STATE AUTO INSURANCE COVERAGE MINIMUMS AND TRAFFIC FATALITIES

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Abstract

Prior research on moral hazard in auto insurance has examined the effect of compulsory insurance, no-fault liability, and tort liability on traffic fatalities. In contrast, this study is the first one to examine the same moral hazard in auto insurance using a different measure, state auto insurance minimum coverage requirements. Similar to previous research, this study finds the existence of moral hazard in auto insurance that leads to higher traffic fatalities. Namely, this study finds that states with higher auto insurance minimum coverage amounts have a higher rate of traffic fatalities. This result is especially relevant, as some states have recently enacted plans to double or raise their minimum coverage amounts in the immediate future.

JEL classifications: G22, H7, J28, K13

Key words: coverage minimums, auto insurance, traffic fatalities, moral hazard

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I. Introduction

Auto insurance minimum coverage amounts vary substantially across states but not over time, as they have presently been in place since 1967[1]. The compulsory insurance law mandates the need for all drivers in that state to at least hold the minimum coverage amount of auto insurance for liability purposes. The minimum coverage amounts entail three separate numbers: the first number signifying the per-person amount of medical liability, the second number signifying the maximum amount of medical liability per accident, and the third number signifying the amount of property liability.

For example, in Pennsylvania, the minimum coverage amounts are 15/30/5[2], represented in thousands. This means the minimum amount of insurance coverage provides a driver with $15,000 of medical liability coverage allotted per person, $30,000 as the maximum amount of medical liability coverage per accident, and $5,000 of property liability coverage. If there is an accident where a driver holding only minimum coverage liability insurance injures three people and totaled their car the following is a possible scenario. Only two of the injured individuals each receive a maximum of $15,000 for their medical coverage, since the maximum medical coverage per accident is $30,000, this leaves one injured individual without compensation. The totaled car is replaced with $5,000. But, the third person would then have the ability to sue the driver for medical damages since there was not enough coverage available to treat that person's medical needs. Up unto that point, the insurance company would take care of the rest.

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[1] Auto Insurance Tips, "State Minimum Auto Insurance Coverage:4 Reasons You Should Not Only Carry the Minimum Required Coverage."

[2] All coverage minimum amounts obtained from www.carinsurancerates.com, "State by State Insurability Requirements."

Pennsylvania is a state with one of the lowest minimum coverage amounts. The highest states, Alaska and Maine, both have minimum coverage amounts of 50/100/25. The lowest state, Mississippi, has minimum coverage amounts of 10/20/5.

This research hypothesizes that minimum coverage amounts are positively correlated with traffic fatalities. It is also hypothesized that in states with higher minimum coverage amounts, the higher rate of traffic fatalities is due to a moral hazard effect, whereby individuals understand they are insured and that the insurance agency will pay for an accident, giving individuals a stronger incentive to drive less carefully than they would if they had no coverage or insurance, found by Cummins, Weiss, and Phillips (2001) and Cohen and Dehejia (2004). This study finds similar evidence for using a previously unexamined variable—minimum coverage amounts. These findings suggest that the states that have recently increased or plan to increase their minimum coverage amounts will see an increase in traffic fatalities due to the moral hazard effect.

II. Literature Review

There is a vast amount of literature surrounding auto insurance and its relationship with traffic fatalities, but only one other paper, Cohen and Dehejia (2004), utilized my variables of interest, the minimum coverage amounts. Thus, the relevant literature is an evolution of the relationship between the different auto insurance laws and traffic fatalities, along with the resulting moral hazard effects. It ends with the research paper that used my variable of interest as a secondary variable, suggesting it for future research. The literature begins by analyzing the benefits of a compulsory insurance law and proceeds onto no-fault liability ramifications.

a. Compulsory Insurance

The enactment of compulsory insurance into law requires all drivers in that a state to obtain at least the minimum amount of auto insurance coverage. To date, 46 out of the 50[3] states have enacted this into law, while the others have similar laws (financial responsibility and notice). Pauly (1974) promoted its enactment to somewhat to combat the situation of asymmetric information in an insurance market that contains imperfect information. Asymmetric information occurs when one of the two or more parties involved know more about a situation and stand to gain from that knowledge, in this case an insurer never knows everything about his client, the insuree. After modeling the optimal price of insurance, it was concluded that the competitive insurance market would always be non-optimal, but enacting compulsory insurance into law would be the next-best solution. This solution was suggested in spite of the risk of moral hazard that may be present if premium prices were to rise with this enactment, as there is potential the prices won't accurately represent all drivers' behavior.

Shavell (1979) modeled the optimal amount of insurance coverage that an individual should obtain and built off of Pauly's research. However, Shavell claimed that there is potential for an optimal solution in the insurance market, even in the presence of imperfect information, disagreeing with Pauly. He concluded that the optimal amount of coverage lies somewhere between full and partial coverage.

b. Early No-Fault

No-fault liability is the alternative to a system of tort negligence in a state. In a state that has adopted a system of no-fault liability, instead of individuals suing each

3 Cohen and Dehejia (2004), "The Effect of Automobile Insurance and Accident Liability Laws on Traffic Fatalities," Table 2: Automobile Liability Insurance Laws."

other in an accident, and determining fault to allocate damages, no-fault does not determine any fault and settles between parties via insurance companies and also takes away the opportunity for parties to sue each other. It is hypothesized that no-fault liability also has moral hazard incentives with regard to fatal traffic accidents, alleging if people lose their tort responsibility and are in an accident where no one is right or wrong, they may become may careless when they drive and lose incentive to be the individual least at fault in an accident. Three early pieces of literature studied the effects of the early consequences of no-fault liability on fatal accidents a few years after its implementation.

Landes (1982) hypothesized and affirmed that no-fault liability limiting tort threshold does correlate with an increase in fatal accidents in states that adopted the no-fault system. This coincides with the moral hazard argument behind no-fault liability. However, Zador and Lund (1986) extended Landes' period of study and found there was no conclusive evidence that no-fault liability laws limiting tort threshold have increased fatal accidents. Kochanowski and Young (1985) used only a three-year period of study but came to the same conclusion as Zador and Lund.

c. Later No-Fault Arguments

Cummins, Weiss, and Phillips (2001) more recently looked at the incentive effects of no-fault liability versus tort liability, hypothesizing and affirming that fatal accident rates were higher in states that adopted no-fault. Their model included unique control variables for weather, speed, rural miles driven, and the proportion of a state with at least a bachelor's degree.

Liao and White (2002) continued the research on no-fault liability, but in regard to efficiency and compared three systems: tort negligence, no-fault liability, and mixed no-fault liability. Their results indicated no system was always most efficient but it was noted that with respect to drivers, the tort system appeared most beneficial, allowing more reward from the process, whereas no-fault receives no direct monetary award from the process.

Harrington (1994) studied specifically what affected a court's decision to enact no-fault liability laws, considering the impact on attorneys and medical care providers, low-income households, and insurance cost growth rates on states that had enacted no-fault liability laws. Their results suggested that states that had a higher number of physicians per capita and higher insurance cost growth rates were more likely to adopt no-fault liability laws, whereas states with a higher number of attorneys per capita were less likely to adopt. Their conclusion makes sense if the moral hazard argument of no-fault liability is true, where states with a higher amount of medical care providers would be necessary to deal with more injuries received from car accidents.

Ma and Schmit (2000) looked at three types of insurance enforcement stringency: compulsory insurance, financial responsibility, and "notice" while analyzing which one of the three types had the least amount of uninsured drivers. Financial responsibility is when you must prove your ability to pay for an accident if necessary, with or without insurance coverage. Notice is a stricter form of financial responsibility that requires notice of a cancellation or nonrenewal of a policy. Their results suggested that the strictest type of regulation, notice, had the lowest level of uninsured drivers and that no-fault states had higher levels of uninsured drivers.

Cohen and Dehejia (2004) examined the relationship of uninsured drivers, no-fault liability laws, compulsory insurance, and state auto insurance coverage minimums on traffic fatalities. Their conclusions suggested that as the proportion of uninsured drivers increased, there was a decrease in the amount of traffic fatalities, suggesting they would be more likely to observe care while driving because they would be more liable than those individuals with insurance. 'Switchers', those who obtained insurance recently and for their first time, were also taken into consideration. It concluded that as the proportion of switchers increased, traffic fatalities also increased. The idea to observe the coverage minimums as a variable of interest was suggested from this paper.

My research builds off of a combination of the previous literature, establishing that without compulsory insurance (or financial responsibility/notice), minimum coverage amounts would be irrelevant, because they would not be required. No-fault liability is a dummy variable in my paper, hypothesizing that for states with it, there is an amplification of the moral hazard effect. But, predominantly, my literature would be the next in the line of this literature review, building off of Cohen and Dehejia (2004), whose paper did not use the coverage minimums as a variable of interest, but suggested studying them close in future research.

As there is a sufficient amount of literature and conclusions regarding compulsory insurance and no fault liability, the coverage minimums are an integral, yet thus unstudied variable of interest. By studying the coverage minimums, the information studied in the auto insurance field is evolving into something new.

III. Data

A balanced panel dataset was used for the 50 U.S. states from 1982 to 2006. This time period was chosen for three reasons. Firstly, the time period accommodated data availability and provided access to the same variables for each year and state. Secondly, the period included the implementation of the auto insurance laws (compulsory insurance and no-fault liability) that are relevant to my variables of interest and may amplify the relationship of the minimum coverage amounts on traffic fatalities. As previously stated, compulsory insurance requires the purchase of these minimum coverage amounts and no-fault liability laws may add to the moral hazard argument, by giving incentive to drive more recklessly. Thirdly, the dataset is more recent, whereas most research in the field is recent to 1998 at the latest. The variables used are listed below in Table 1:

Table 1: Variables and Sources

Variable	Name	Unit	Source
TF_{it}	Traffic Fatalities	Rate per Thousands of Population	The Fatal Accident Reporting System
$Young_{it}$	Young Population: The Percentage of 18-24 years of age people in a state	Rate, Young Population/ Total Population	Statewide Availability Data System II: 1933 to 2003[4] & US Census Bureau Statistical Abstract
Old_{it}	Old Population: The Percentage of 65 and older people in a state	Rate, Old Population/ Total Population	Statewide Availability Data System II: 1933 to 2003 & US Census Bureau Statistical Abstract
$Rgas_{it}$	Real Gas Price	Per gallon, in 2006 $	Energy Information Administration
$Rgdp\_cap_{it}$	Real GDP per Capita	Real GDP/ Total Population	Bureau of Economic Analysis
$Poppersqmiland_{it}$	Population per Square Mile of Land	Total Population/ Square Miles of Land	US Census Bureau Statistical Abstract
$PrimarySeatbelt_{it}$	Primary Seatbelt Law	Dummy Variable: 1 if State has a Primary Seatbelt Law, 0 if otherwise	National Highway Traffic Safety Administration & The Fatal Accident Reporting System
$Nofault_{it}$	No-Fault Liability Law	Dummy Variable: 1 if a State has a No-Fault Liability Law, 0 if otherwise	Cohen and Dehejia (2004) Table 2[5]
$AnnualRain_{it}$	Average Annual Rainfall	Inches	Between Waters[6]
$MtnState_{it}$	Mountain State	Dummy Variable: 1 if a State is a member of the Rocky Mountain census region, 0 if otherwise	US Census Bureau Statistical Abstract
$PerPersLiaMin_{it}$	Per-person Liability Minimum Coverage Amount	Minimum Coverage Amount adjusted for Inflation (using Regional CPI)	Insurance Rates[7]
$PropLiaMin_{it}$	Property Liability Minimum Coverage Amount	Minimum Coverage Amount adjusted for Inflation (using regional CPI)	Insurance Rates[8]

The variables of interest, *PerPersLiaMin* and *PropLiaMin*, both measure the minimum coverage amounts allotted per state. The former variable, *PerPersLiaMin*, is

4 Ponicki, W. R. (2004) Statewide Availability Data System II: 1933 - 2003.

5 Cohen, A. and Dehejia, R. 2004. "The Effect of Automobile Insurance and Accident Liability Laws on Traffic Fatalities." Appendix Table 2: Automobile Liability Insurance Laws.

6 Average Annual Rainfall for U.S. States, 1988. www.betweenwaters.com, 2000-2006.

7 State-by-State Insurability Requirements. 2009. www.carinsurancerates.com

8 State-by-State Insurability Requirements. 2009. www.carinsurancerates.com

the allotted minimum coverage amount for per-person medical liability and the latter variable, *PropLiaMin*, is the allotted minimum coverage amount for property liability. In the result of an accident, the injured individual may receive up to that amount of minimum coverage for medical care and may then sue for the remainder, likewise for the property liability coverage. Since these values rarely change over time, the amounts have both been adjusted for inflation by using a regional consumer price index measure to make them time variant, not time invariant.

Control variables for climate, geography, and real gas price were included in my model as suggested by Yakovlev and Inden (2008), who found these variables to be among the strongest determinants of traffic fatalities. *AnnualRain* takes into account the climate of a region by the amount of average annual rainfall they receive. It is hypothesized that the higher the average annual rainfall amount, the higher the likelihood of an increased rate of traffic fatalities occurring from weather-related accidents. *MtnState* takes into account climate and geography, by using a dummy variable to indicate states that are in the Rocky Mountain census region. This region was chosen to account for states that are known to have mountainous terrain and snowy conditions that may also yield a higher rate of traffic fatalities in inclement weather. *RealGas* takes into account the cost of driving and hypothesizes that as the cost of driving decreases, individuals drive more and are more prone to get into accidents.

Age-related control variables were also included to take into account drivers that may be more likely to cause more traffic fatalities and accidents than others. *Young* was included to control for inexperienced drivers, as suggested by Asch and Levy (1990) who concluded that both drinking experience and driving experience have an impact on traffic fatalities. This variable measures the population percentage of a state aged 18-24, capturing both inexperienced drivers (as most legal driving ages are 16 or 18) and inexperienced drinkers (as the minimum legal drinking age is 21). *Old* was included as a control for the safe and aging drivers of a population, a negative correlation with traffic fatalities would be expected.

PrimarySeatbelt was included as suggested by Yakovlev and Inden (2008), Derrig, et al. (2002), Kahane (2000), Beck et al. (2007), and Cohen and Einav (2003), as a variable that reduces traffic fatalities and as a proxy for seatbelt usage.

IV. Models

Two models with two minimum coverage measures are estimated in this study. The two minimum coverage amounts used in the models are the per-person medical liability in the first model and property liability in the second model. The models appear as the following:

Model 1:

$$\begin{aligned} TF_{it} &= \alpha + \beta_1 YOUNG + \beta_2 OLD + \beta_3 RGAS + \beta_4 RGDPCAP \\ &+ \beta_5 POPPERSQMILAND + \beta_6 PRIMSEATBELT + \beta_7 NOFAULT \\ &+ \beta_8 ANNUALRAIN + \beta_9 MTNSTATE + \beta_{10} PERPERSLIAMIN \end{aligned} \tag{1}$$

Model 2:

$$\begin{aligned} TF_{it} &= \alpha + \beta_1 YOUNG + \beta_2 OLD + \beta_3 RGAS + \beta_4 RGDPCAP \\ &+ \beta_5 POPPERSQMILAND + \beta_6 PRIMSEATBELT + \beta_7 NOFAULT \\ &+ \beta_8 ANNUALRAIN + \beta_9 MTNSTATE + \beta_{10} PROPLIAMIN \end{aligned} \tag{2}$$

Where:

Table 2: Model Variables

TF	=	Rate of traffic fatalities per state/total population of that state
YOUNG	=	Percentage of population aged 18-24 within a state
OLD	=	Percentage of population aged 65 and older within a state
RGAS	=	Real gas price
RGDPCAP	=	Real GDP/total population of the state
POPSQMILAND	=	Total population/total square miles of land within a state
PRIMSEATBELT	=	Dummy variable for states with a primary seatbelt law
NOFAULT	=	Dummy variable for no-fault liability law states
ANNUALRAIN	=	Average annual rainfall
MTNSTATE	=	Dummy variable for states within Rocky Mountain Census Region.
PERPERSLIAMIN	=	Minimum coverage amount for per-person medical liability adjusted for inflation.
PROPLIAMIN	=	Minimum coverage amount for property liability adjusted for inflation.

A pair-wise correlation is used to examine the correlation between the variables in the models (Appendix 1) and shows no alarming multicollinearity. Also, a variance inflation factor test indicated no presence of multicollinearity. A Breusch-Pagan/Cook-Weisburg test indicates the data had the presence of heteroscedasticity. Arellano-Bond and Wooldridge tests confirmed the model had the presence of a first-order autocorrelation process. The Pesaran test indicated that contemporaneous correlation was also present in the model.

A Hausman specification test was run on the model to determine whether a fixed effects model or a random effects model would be most appropriate. The test affirmed that a fixed effects model would be the most appropriate model versus a random effects model.

In addition to the anomalies present in the data, two of the variables in the model are time-invariant: *MtnState* and *AnnualRain*. Since these variables are unchanging over time, they would be dropped from a normal fixed effects model. Plümper and Troeger (2007) recommend an FEVD model, which is a fixed-effects regression with a vector decomposition estimator, to deal with the time invariant variables. However, this procedure does not correct for the heteroscedasticity, the first-order autocorrelation, and the contemporaneous correlation. Thus, I ran a panel-corrected standard errors procedure (PCSE), but included the *eta* error term from the FEVD model to capture the fixed effects that are uncorrelated with the time invariant variables and allow the time invariant variables' presence to be in the model without being dropped. All the while, the residuals of the final modeled data were tested for nonstationarity using the Im, Pesaran, and Shin W-stat, ADF-Fisher Chi-square, and PP-Fisher Chi-square tests, all indicating a rejection of the null of nonstationarity, concluding that the dataset was stationary.

V. Results

Table 2: Model 1 Regression Output from FEVD-PCSE Model

TF	Coefficient	Standard Error
CONSTANT	0.1027***	0.0133
YOUNG	0.5384***	0.0725
OLD	-0.5176***	0.065
RGAS	-0.0002**	0.0001
RGDP_CAP	$1.65\text{x}10^{-6}$***	$2.53\text{x}10^{-7}$
POPPERSQMILAND	-0.2667***	0.0078
PRIMARYSEATBELT	-0.0043*	0.0022
NOFAULT	0.0039**	0.0019
ANNUALRAIN	0.0026***	0.0001
MTNSTATE	0.0783***	0.0052
PERPERSLIAMIN	0.0167***	0.003
ETA	0.9697***	0.0444
R^2: 0.8883		

*** Indicates significance at 1%, ** Indicates significance at 5%, * Indicates significance at 10%
ETA was the error term produced from the FEVD model.

Table 3: Model 2 Regression Output from FEVD-PCSE Model

TF	Coefficient	Standard Error
CONSTANT	0.111***	0.0126
YOUNG	0.6105***	0.0722
OLD	-0.5735***	0.0641
RGAS	-0.0001**	0.0001
RGDP_CAP	1.40×10^{-6}***	2.37×10^{-7}
POPPERSQMILAND	-0.2635***	0.0075
PRIMARYSEATBELT	-0.0046**	0.0023
NOFAULT	0.0028	0.002
ANNUALRAIN	0.0026***	0.0001
MTNSTATE	0.0771***	0.0055
PROPLIAMIN	0.0202***	0.0036
ETA	0.9749***	0.0458
R^2: 0.8902		

*** Indicates significance at 1%, ** Indicates significance at 5%, * Indicates significance at 10%
ETA was the error term produced from the FEVD model.

The variables of interest, the per-person medical liability minimum coverage and the property liability minimum coverage both came out as hypothesized, positively correlated with the traffic fatality rate per state. This affirmed my hypothesis that states with higher minimum coverage amounts would correspondingly have a higher rate of traffic fatalities than those states with lower minimum coverage amounts. An example of this is Alaska and Mississippi. Alaska is one of the highest states at 50/100/25 and Mississippi is one of the lowest states at 10/20/5. The comparison showed that Model 1 yielded a 40.92% increase in traffic fatalities and Model 2 yielded a 36.42% increase in traffic fatalities. Data from 2005 was used for the comparison because Mississippi changed their minimum coverage amounts in 2006.

The control variables came out as expected. *GDP_Cap* and *RealGas* being positively correlated with traffic fatalities in the model is also consistent with the law of demand. As these two variables increase, this would also indicate an increase in driving, which is considered a normal good, which typically indicates an increase in traffic fatalities.

Young and *Old* both were expected, as *Young* captured the positive correlation the population percentage of expected inexperienced and wreckless drivers who would be more likely to be involved in an accident with traffic fatalities. *Old* captured the negative correlation between the population percentage of expected responsible and safe drivers on traffic fatalities.

AnnualRain and *MtnState* both came out as expected, reinforcing the climate and geographical determinants of traffic fatalities that Yakovlev and Inden (2008) also found. *PopPerSqMiLand* was also expected, because the larger this ratio becomes, the more people are living on less land. As this happens, there is the potential to have a city effect where depending on the size and distance of the city, less people drive.

PrimarySeatbelt and *NoFault* both came out as expected, as *PrimarySeatbelt* has a negative correlation with traffic fatalities and *NoFault* being a positive correlation with traffic fatalities is consistent with the hypothesis of moral hazard, and the other recent research findings in the field. However, the lack of significance for *NoFault* in Model 2 may indicate that the insurance coverage minimums perhaps measure the moral hazard effectively than *NoFault*, reinforcing my study and hypothesis.

Test models also omitted *NoFault,* but the results did not change dramatically, they were more or less the same as with it included in the model. That also can be said for the time-invariant variables, *AnnualRain* and *MtnState*, where the results also do not change dramatically. Although they could be dropped without much effect, I feel that these three variables should be included for their logical relationship with traffic fatalities and prior research, including Cummins, Weiss, and Phillips (2001) and Cohen and Dehejia (2004).

VI. Economic Implications

The results of my variables of interest—the per-person medical liability minimum coverage amount and property liability minimum coverage amount both being significant and positively correlated with the traffic fatalities rate is a cause for concern. Six states are in the process of increasing their minimum coverage amounts or have already done so. These states include Alabama, Colorado, Mississippi, South Carolina, Texas, Utah, and Wisconsin. Although the minimum coverage amounts themselves have otherwise never changed since their implementation, the amounts were adjusted for inflation in my models to become time variant. Some of the new amount increases are very large, some matching Alaska and Maine's 50/100/25 minimum coverage amounts (Appendix 4).

Raising the minimum coverage amounts would lead me to hypothesize a corresponding increase in traffic fatalities, especially in the states that also enacted no-fault liability (Colorado and Utah). Despite no-fault liability being significant in p-value in only the first of my two models, other research (Cummins, Weiss, and Phillips (2001) and Cohen and Dehejia (2004)) has shown the no-fault liability system being positively correlated with traffic fatalities.

For example, Mississippi increased their minimum coverage amounts within my dataset, implementing them in 2006. The difference from 2005's old minimum coverage amounts to 2006's new minimum coverage amounts was quantified in traffic fatalities for Model 1, showing an increase of 19 people, whereas Model 2 showed an increase in traffic fatalities of 43 people. This is also logical because the per-person medical liability minimum coverage that Model 1 utilizes was increased by a factor of 2.5, whereas the property liability minimum coverage used in Model 2 was increased by a factor of 5.

In Wisconsin, the opposite scenario is forecasted. Ceteris paribus, using 2006 data, the expected increase in traffic fatalities in Model 1 is 47 people, whereas in Model 2 the expected increase in traffic fatalities is 11 people. This is also logical, but backwards as compared to Mississippi, because the per-person medical liability minimum coverage that Model 1 utilizes was increased by a factor of 2, whereas the property liability minimum coverage used in Model 2 was by a smaller increase.

I feel that possible ways to minimize this impact on future traffic fatalities would be to raise premiums and deductibles proportionately with an increase in minimum coverage amounts, allowing states to create a feeling of responsibility in their drivers to encourage individuals to be more cognizant of their driving behavior and the ramifications accidents and careless driving impose on other people.

VII. Suggestions for Future Research

As this dataset is only dated to 2006, expanding the dataset to include years as they become available and also as updating the minimum coverage amounts for the six states in question would be interesting. I would hypothesize that as the minimum coverage amounts increase, there would be a stronger relationship with traffic fatalities.

Studying average premiums and average deductibles by state would be another suggestion for future research. If minimum coverage amounts continue to increase across the board, the only answer would be to proportionately increase premiums and deductibles. By proportionately increasing these, drivers would have incentive take responsibility for their actions and carelessness while driving. If premiums increased too high though, I would hypothesize that there would be a point at which individuals would cease purchasing auto insurance, risk breaking the law, and risk losing their own assets (if they were to get sued).

VIII. Conclusions

This research sought to determine if auto insurance minimum coverage amounts had a positive relationship with traffic fatalities. After obtaining the relevant data and inserting applicable control variables, I proceeded to run two separate, but nearly identical models using PCSE regressions with error terms obtained from prior FEVD regressions. This allowed the two time invariant variables to be both present in the model and to also correct the presence of heteroscedasticity, first-order autocorrelation, and contemporaneous correlation.

After running these models, the results affirmed my hypothesis that auto insurance minimum coverage amounts did have a positive relationship with traffic fatalities. This posed an economic implication as six states recently enacted laws to increase their minimum coverage amounts. By establishing this relationship, there is concern that the relationship between minimum coverage amounts and traffic fatalities will grow stronger and only amplify the moral hazard effect on traffic fatalities. Future research should continue this model with updated and new data on these minimum coverage amounts as they are enacted and their respective control variables, as well as also including average premiums and average deductibles as variables.

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Appendix 1
Correlation Tests

Pairwise Correlation Matrix

	TF	Young	Old	RGas	RGDP_Cap	PopPerSqMiLand	PrimarySeatbelt	NoFault	AnnualRain	MtnState	PerPersLiaMin	PropLiaMin
TF	1.0000											
Young	0.2446*	1.0000										
Old	-0.1132*	-0.1508*	1.0000									
RGas	0.1030*	0.4609*	-0.0877*	1.0000								
RGDP_Cap	-0.2382*	-0.1163*	-0.3183*	0.0220	1.0000							
PopPerSqMiLand	-0.5366*	-0.1426*	0.2185*	-0.0455	0.2190*	1.0000						
PrimarySeatbelt	-0.1772*	-0.2067*	-0.0272	-0.0332	0.1595*	0.1225*	1.0000					
NoFault	-0.3643*	-0.0233	0.1127*	-0.0138	0.0858*	0.2998*	0.0094	1.0000				
AnnualRain	-0.1018*	-0.0115	0.1032*	0.0201	0.0670*	0.3157*	0.0649*	-0.0491	1.0000			
MtnState	0.3847*	0.0285	-0.2756*	-0.0274	-0.0750*	-0.2823*	-0.1239*	-0.0314	-0.7266*	1.0000		
PerPersLiaMin	0.1577*	0.3563*	-0.0620*	0.1942*	-0.4444*	-0.2516*	-0.2538*	-0.0862*	-0.0464	0.0225	1.0000	
PropLiaMin	0.1450*	0.3359*	0.0063	0.1663*	-0.3921*	-0.2239*	-0.2246*	-0.1773*	-0.0915*	0.0191	0.7609*	1.0000

*** indicates a significance of 0.05.**

Appendix 2
FEVD Model Results

FEVD Model 1

TF	Coefficients	Standard Error	P-Value
CONSTANT	0.0767	0.0089	0.000
YOUNG	0.562	0.049	0.000
OLD	-0.4723	0.0356	0.000
RGAS	-0.0002	0.00003	0.000
RGDP_CAP	2.32×10^6	1.62×10^7	0.000
POPPERSQMILAND	-0.2726	0.0039	0.000
PRIMARYSEATBELT	-0.0092	0.0015	0.000
NOFAULT	0.0058	0.0015	0.000
ANNUALRAIN	0.0026	0.0001	0.000
MTNSTATE	0.0778	0.0025	0.000
PERPERSLIAMIN	0.0221	0.0016	0.000
ETA	1	0.0163	0.000
R^2: 0.89103			

FEVD Model 2

TF	Coefficients	Standard Error	P-Value
CONSTANT	0.0898	0.0089	0.000
YOUNG	0.6505	0.0496	0.000
OLD	-0.5462	0.0361	0.000
RGAS	-0.0002	0.00003	0.000
RGDP_CAP	1.94×10^6	1.55×10^7	0.000
POPPERSQMILAND	-0.2688	0.0039	0.000
PRIMARYSEATBELT	-0.0103	0.0015	0.000
NOFAULT	0.0046	0.0015	0.002
ANNUALRAIN	0.0026	0.00007	0.000
MTNSTATE	0.077	0.0025	0.000
PROPLIAMIN	0.0247	0.0022	0.000
ETA	1	0.0165	0.000
R^2: 0.889			

Appendix 3: Minimum Coverage Amounts by State

State	Per Person Medical Liability	Per Accident Max Medical Liability	Property Liability
Alabama	20	40	10
Alaska	50	100	25
Arizona	15	30	10
Arkansas	25	50	15
California	15	30	5
Colorado	25	50	15
Connecticut	20	40	10
Delaware	15	30	5
Florida	10	20	10
Georgia	15	30	10
Hawaii	20	40	10
Idaho	20	50	15

State	Per Person Medical Liability	Per Accident Max Medical Liability	Property Liability
Illinois	20	40	15
Indiana	25	50	10
Iowa	20	40	15
Kansas	25	50	10
Kentucky	25	50	10
Louisiana	10	20	10
Maine	50	100	25
Maryland	20	40	10
Massachusetts	20	40	5
Michigan	20	40	10
Minnesota	30	60	10
Mississippi	10	20	5
Missouri	25	50	10
Montana	25	50	10
Nebraska	25	50	25
Nevada	15	30	10
New Hampshire	25	50	25
New Jersey	15	30	5
New Mexico	25	50	10
New York	25	50	10
North Carolina	30	60	25
North Dakota	25	50	25
Ohio	13	25	8
Oklahoma	10	20	10
Oregon	25	50	10
Pennsylvania	15	30	5
Rhode Island	25	50	25
South Carolina	15	30	10
South Dakota	25	50	25
Tennessee	25	50	10
Texas	20	40	15
Utah	25	50	15
Vermont	25	50	10
Virginia	25	50	20
Washington	25	50	10
West Virginia	20	40	10
Wisconsin	25	50	10
Wyoming	25	50	20

Appendix 4: Expected/Implemented Minimum Coverage Amount Increases

State	Date	Prior Minimums	New Minimums
Alabama	August 30, 2008	20/40/10	25/50/25[9]
Mississippi	January 1, 2006	10/20/5	25/50/25[10]
South Carolina	January 1, 2007	15/30/10	25/50/25[11]
Texas	April 1, 2008	20/40/15	25/50/25[12]
Utah	January 1, 2009	25/50/15	25/65/15[13]
Wisconsin	January 1, 2010	25/50/10	50/100/15[14]

9 Alabama Source: www.carinsurance.com/state/Alabama-car-insurance.aspx

10 Mississippi Source: www.encyclopedia.com/doc/1G1-139166277.html

11 South Carolina Source: http://www.scinsnews.com/newsroom_detail.php?newsID=233&page=20

12 Texas Source: http://www.thefreelibrary.com/Texas+Liability+Insurance+Requirements-a01073910932

13 Utah Source: http://www.carinsurance.com/state/Utah-car-insurance.aspx

14 Wisconsin Source: http://www.docstoc.com/docs/14439490/Auto-Insurance-is-Changing-in-Wisconsin